FIG.1

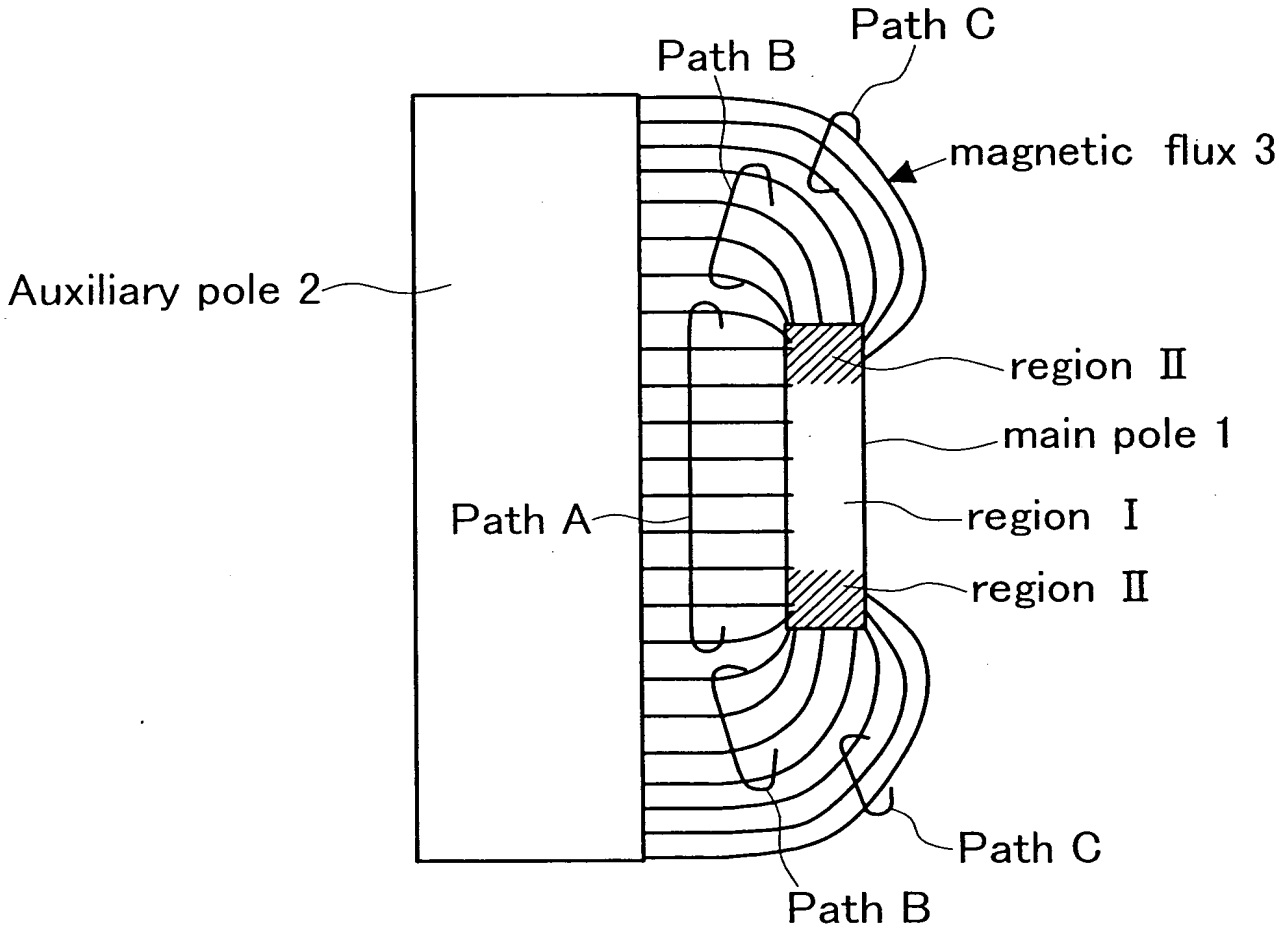

Path C
Path B
magnetic flux 3
Auxiliary pole 2
region II
main pole 1
Path A
region I
region II
Path C
Path B

FIG.2

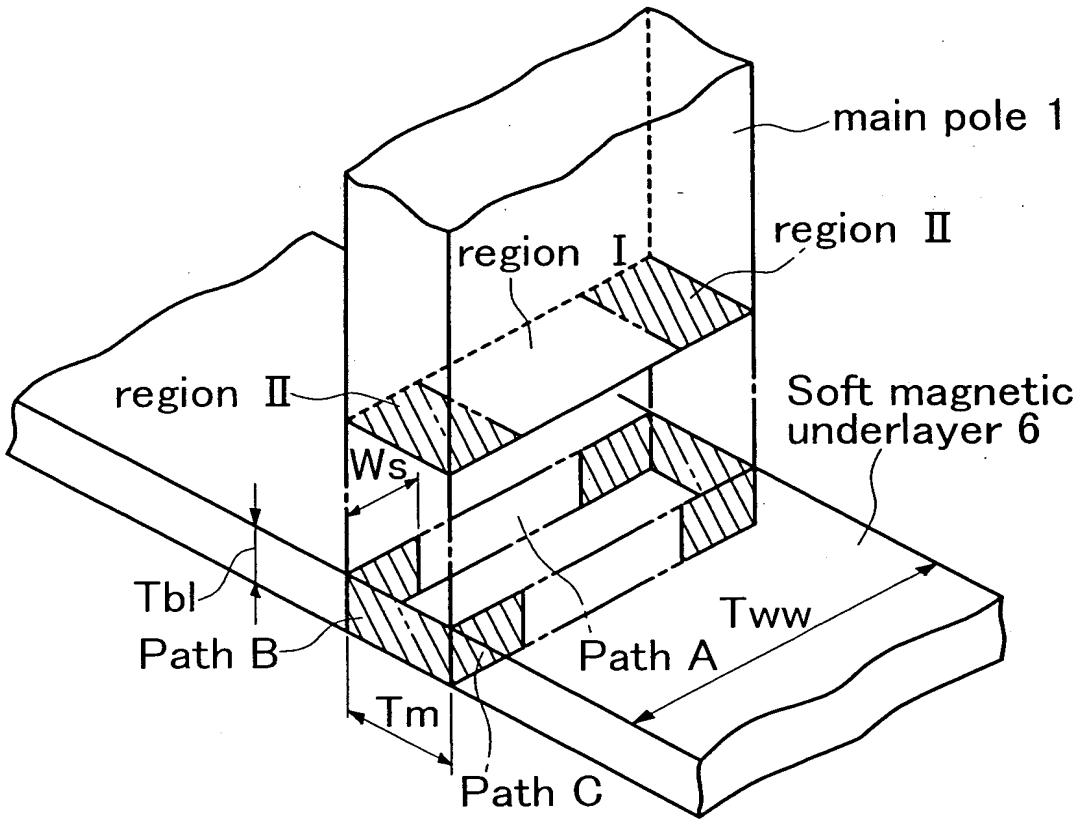

main pole 1
region I
region II
region II
Soft magnetic underlayer 6
Ws
Tbl
Path B
Path A
Tww
Tm
Path C

FIG.3

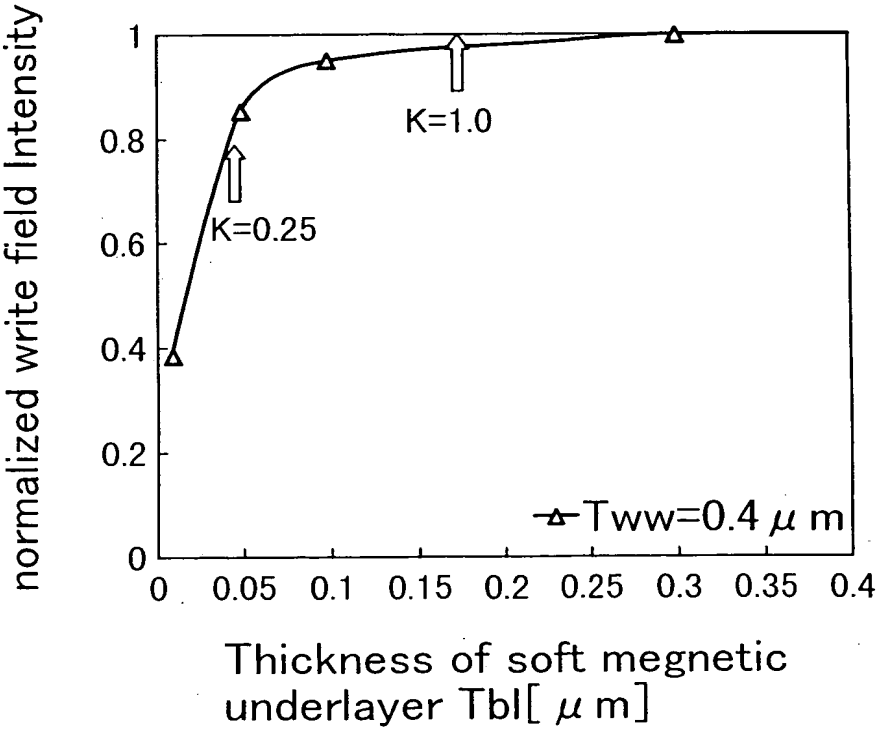

normalized write field Intensity
1
0.8
0.6
0.4
0.2
0
K=1.0
K=0.25
Tww=0.4 μ m
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Thickness of soft megnetic underlayer Tbl[μ m]

FIG.4

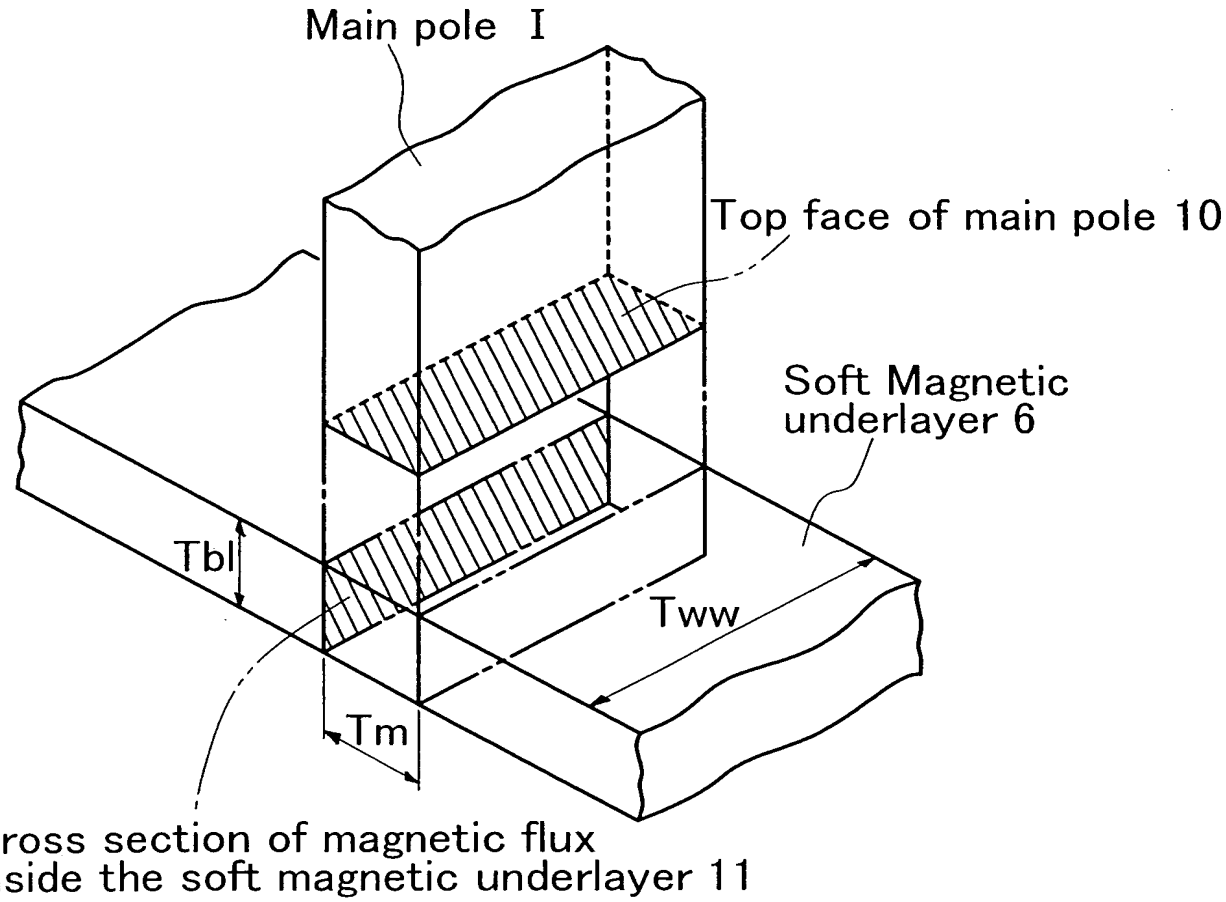

Main pole I
Top face of main pole 10
Soft Magnetic
underlayer 6
Tbl
Tww
Tm
Cross section of magnetic flux
inside the soft magnetic underlayer 11

FIG.5

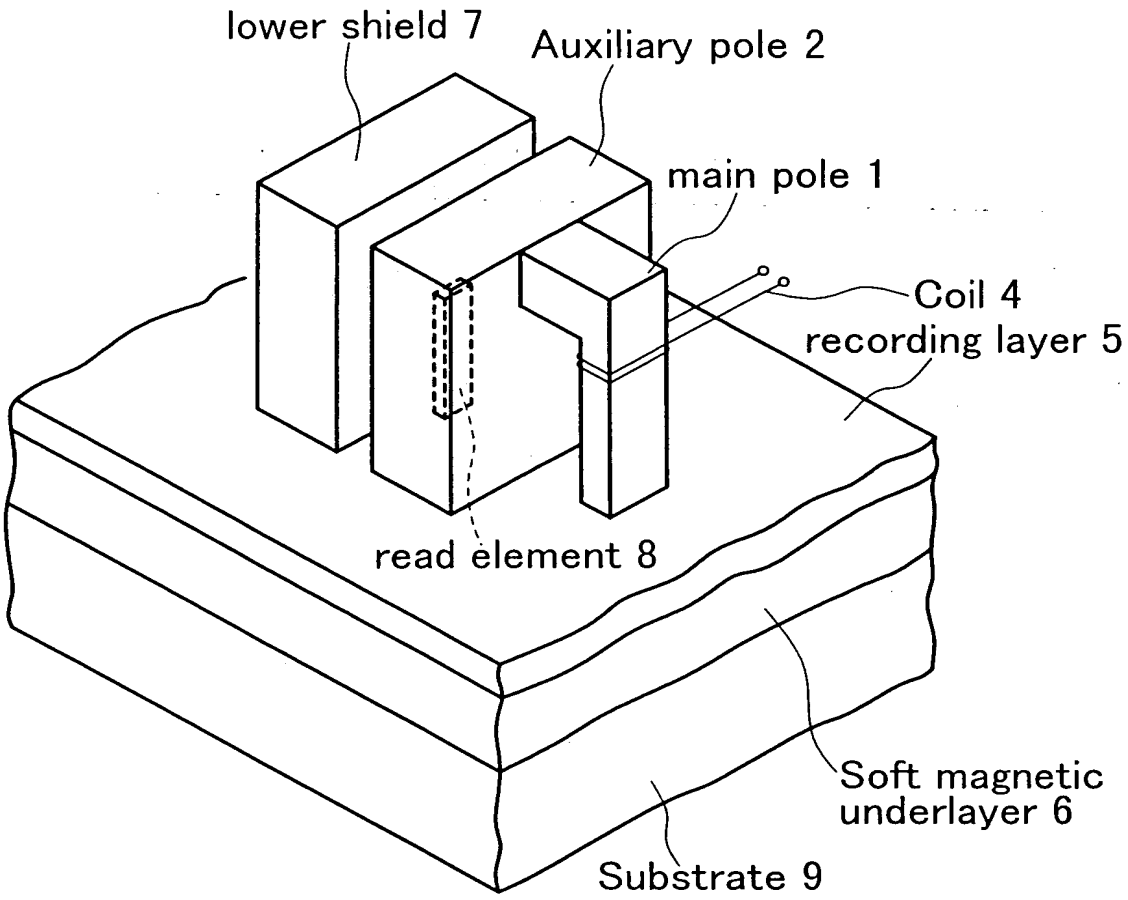

lower shield 7
Auxiliary pole 2
main pole 1
Coil 4
recording layer 5
read element 8
Soft magnetic underlayer 6
Substrate 9

FIG.6

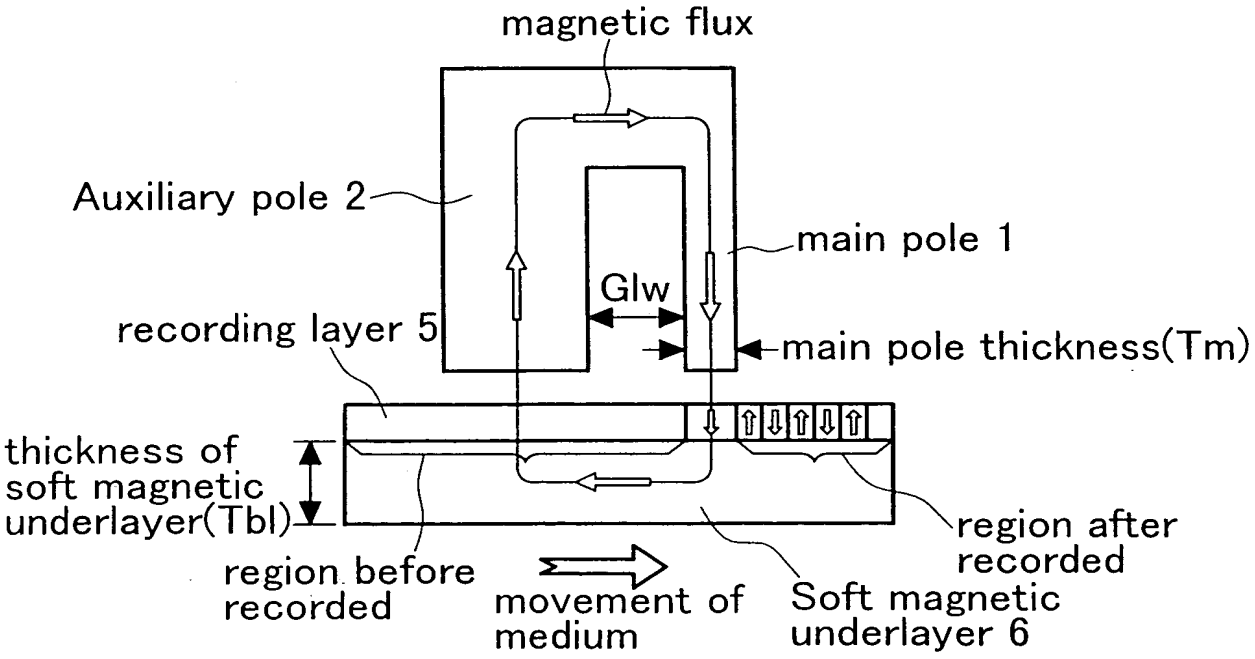

magnetic flux
Auxiliary pole 2
main pole 1
Glw
recording layer 5
main pole thickness(Tm)
thickness of soft magnetic underlayer(Tbl)
region before recorded
movement of medium
Soft magnetic underlayer 6
region after recorded

FIG.7

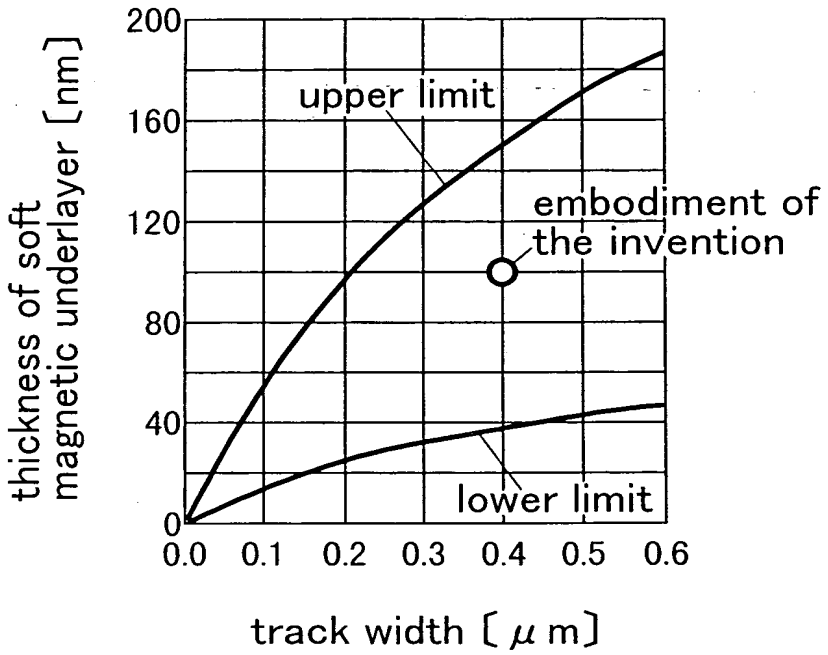

thickness of soft magnetic underlayer [nm]
200
160
120
80
40
0
upper limit
embodiment of the invention
lower limit
0.0
0.1
0.2
0.3
0.4
0.5
0.6
track width [μm]

FIG.8

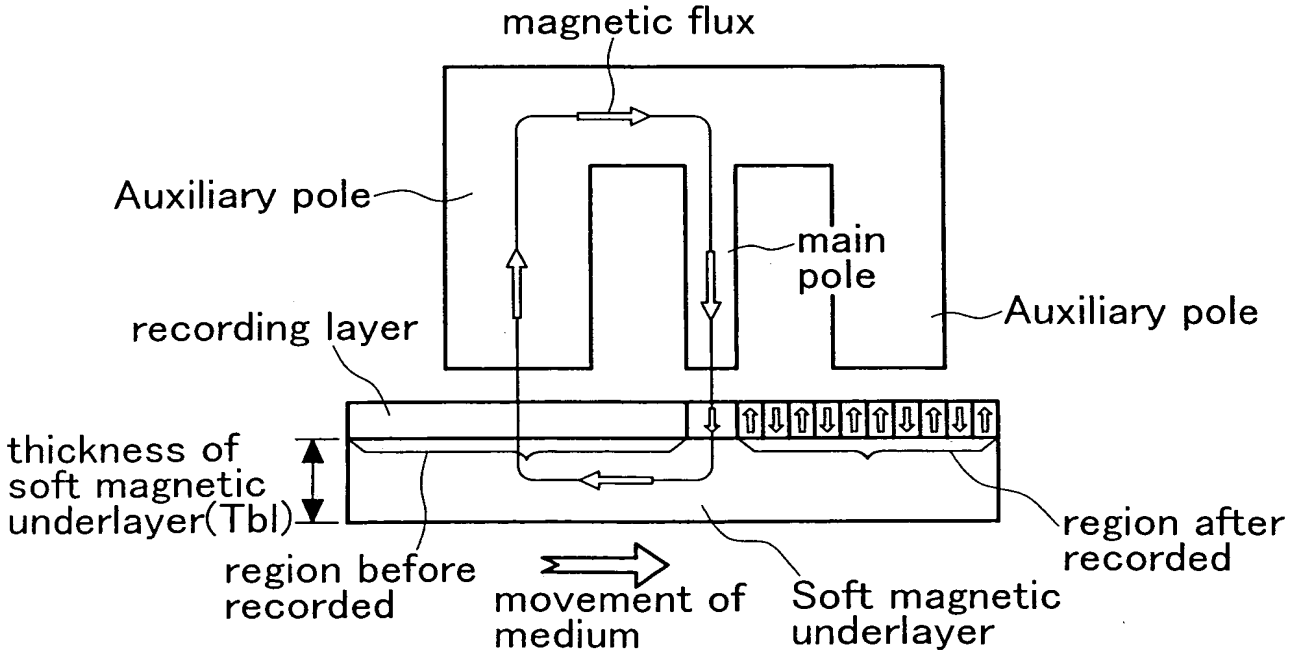

magnetic flux
Auxiliary pole
main pole
Auxiliary pole
recording layer
thickness of soft magnetic underlayer(Tbl)
region before recorded
movement of medium
Soft magnetic underlayer
region after recorded

FIG.9

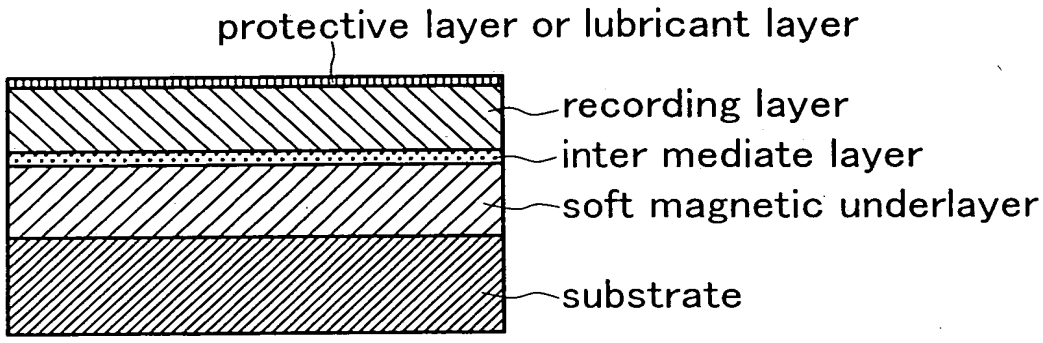
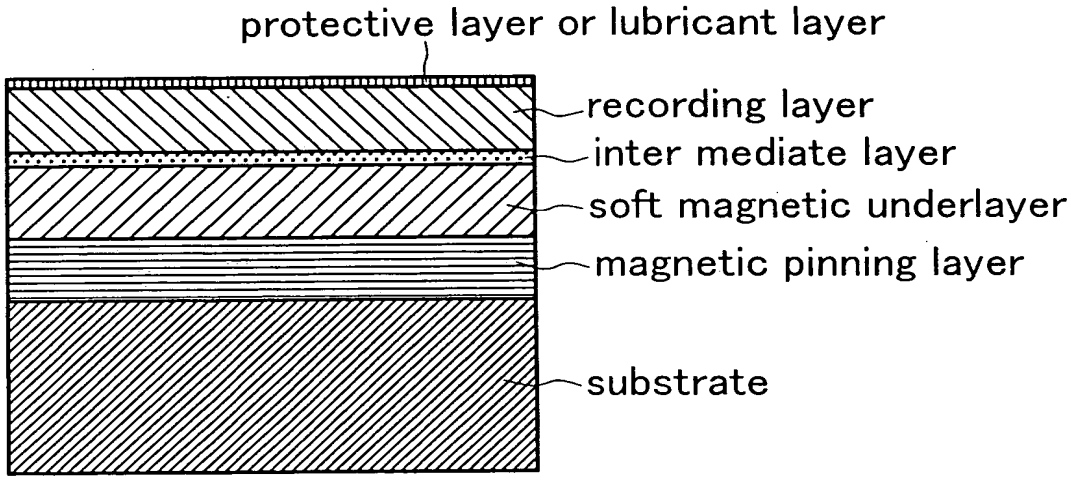

protective layer or lubricant layer
recording layer
inter mediate layer
soft magnetic underlayer
substrate

FIG.10


protective layer or lubricant layer
recording layer
inter mediate layer
soft magnetic underlayer
magnetic pinning layer
substrate